CHAPTER I

MATERIALS AND METHODS

Recording the breeding schedule

The breeding schedule of the House Swift in 1966 was recorded in the study colony by Naik and Razack (1967) by checking the nests almost everyday and these nest-checking records were available to me. In 1967, I checked and recorded quite frequently the contents of a large number of nests in the colony. From these records, it became possible to estimate the egg-laying dates in the colony. In 1968, the nests could not be checked with any regularity until June, so that the timings of the egg-laying period of the first breeding season was not determined. After June that year, a selected number of nests were checked every day, so that the egg-laying dates in May could be calculated and those in June to September actually recorded.

Collecting the birds

The House Swifts were collected during the period from January 1967 to December 1968 from a colony, near Gendigate in Baroda, which was also the site for some of the earlier studies on the House Swift (Naik and Razack, 1967; Razack and Naik, 1968). These birds were collected
from their nests after they roosted for the night. Each pair was marked before it was transferred to a collection-cage and the contents of its nest were recorded. The birds were immediately removed to the laboratory where they were decapitated, dissected and sexed. The gonads and functional oviduct, and some of the internal organs for other studies, were removed. After that the birds without head were examined for moult; the head was not used for the moult study.

**Recording the moult**

Moult was studied in 150 birds in 1967 and 134 birds in 1968. Apart from these birds, a large number of formalin preserved birds collected in 1966 for the studies of gonadal cycle in relation to the nesting cycle by Naik and Razack (1967) were available and also used for the study of primary and tail mouls. Also available were most of the birds from a series collected in 1964 by Naik and Naik (1964a,b) and in this series the tail moult was re-evaluated.

Preserved birds have to be used for a moult study with caution. The length of a feather, whether full-grown or in growth, is not affected by preservation. However, a nearly full-grown feather may loose its basal sheath under preservation and such a feather may erroneously be considered as a full-grown feather. Obviously therefore,
the number of feathers growing together can not be estimated correctly in a preserved specimen.

**Recording the moult of primaries**

The growing primaries were measured from the point they emerge from the skin to the tip, in mm. The lengths of the moulting primaries and the lengths of the full-grown primaries of both the wings in a bird, were added up and the value (total length of the primaries grown on both the wings, in mm) so obtained was considered the primary moult score for that bird. Length of a full-grown primary was not actually measured in each bird, but was an average value calculated in advance by measuring the primary in question in ten individual birds in fresh plumage. The average length of the individual primaries in mm is as follows (standard deviation in each case 1 to 2 mm):

- P1 - 36, P2 - 43, P3 - 50, P4 - 58; P5 - 66, P6 - 73,
- P7 - 82, P8 - 90, P9 - 94, P10 - 93. The lengths of all the primaries in each wing when added up, make a total of 685 mm, so that a maximum primary score assigned to a swift is 1370.

Miller (1961), Ashmole (1962), Williamson (1962), Newton (1966) and Evans (1966) recorded the progress and state of moult in the birds studied by them, by a scoring
system in which a primary of each wing is given a score 0 (old) to 5 (new) according to its state of growth. The sum of the score of individual primaries was taken as an index of the general state of moult. A scoring system of this type can be employed if all the primaries in a set are of approximately the same length, so that a score denoting a particular length grown by a feather also denotes the same length grown by other feathers in the set. Such a scoring system is not suitable for the study of the primary moult in the House Swift, as it has primaries of different lengths.

Recording the moult of secondaries

The old, missing, growing and fully-grown secondaries were noted on both the wings and the length of growing secondaries were measured in mm from the point of insertion in the skin to the tip. The scoring system used for scoring the primary moult was used for scoring the secondary moult also. The secondary score for a House Swift was obtained by adding the lengths (in mms) of full-grown and growing secondaries of both the wings. The average length of individual secondaries in the House Swift in mm is as follows: S1 - 30, S2 - 31, S3 - 31, S4 - 32, S5 - 32, S6 - 33, S7 - 28, S8 - 22, S9 - 13. Due to irregularities in the moult of proximal group of secondaries, only the moult of secondaries 1 to 6 are considered and hence the moult score for a bird
that renewed secondaries 1 to 6 (both the wings) is 378.

**Recording the moult of wing coverts**

Each wing covert on both the wings of a bird was carefully examined, the degree of wear or the state of growth was noted and then assigned to one of the three categories: old, moulting and new. In a small proportion of birds, the moult in certain series of coverts was not recorded either because these coverts were damaged or showed signs of extreme wear which made an accurate determination of their moulting status difficult.

**Recording the tail moult**

The missing, growing and full-grown rectrices were noted and the lengths of the growing rectrices were measured from the point they emerge from the skin to the tip. Differences in the colour and wear of the tail feathers were also observed.

As in the case of primaries and secondaries the birds were assigned moult score to denote progress in their tail moult. The tail moult score for a bird was calculated by adding up the lengths (in mm) of the full-grown and growing rectrices of both the sides and the total obtained was the moult score of that bird. The average length of the individual rectrices, in mm, is as
follows (the standard deviation less than 1 mm in each case): R1 - 39, R2 - 40, R3 - 42, R4 - 43, R5 - 44. Since the total length of five pairs of full-grown rectrices is 416 mm, the maximum rectrix moult score assigned to a bird, on completing a particular moult cycle in question was 416.

Recording the body moult

The House Swifts collected on different dates during 1967 and 1968 were examined for body moult. For the study of body moult in the House Swift, the feathers of the following regions were examined: dorsal cervical region, interscapular region, dorsal region and pelvic region of the dorsal tract; humeral tract; femoral tract; ventral cervical region, sternal region and abdominal region of the ventral tract. The percentage of feathers moulting in each of these 9 regions was recorded. The body moult intensity index per each bird was calculated by adding up the percentage of feathers moulting in the nine regions and dividing the sum by 9.

Study of gonads and oviduct

The gonads were removed from the House Swifts and weighed in a Mettler balance. From the females, the oviduct was also removed and weighed. The gonads were
then fixed in Bouin's fixative and wax sections of 5-6 μ thickness were taken. The sections were stained with Haematoxylin and Eosin for microscopic examination.

In order to indicate the amount of spermatogenic activity, the testes were assigned to one of the stages of histologic development outlined by Bartholomew (1949) and used for House Swift by Naik and Naik (1965) and Naik and Razack (1967). The stages of testis cycle are:

Stage 1: Fully regressed testis in which (1a) all the spermatogonia are resting, or (1b) a few spermatogonia have started dividing.

Stage 2: Dividing spermatogonia.

Stage 3: Many spermatocytes.

Stage 4: Spermatocytes and spermatids, but no spermatozoa.

Stage 5: Spermatids with a few spermatozoa.

Stage 6: Peak spermatogenic activity with numerous spermatozoa.

Stage R: Regressing testis.

The ovarian growth was determined by measuring the diameter of the largest healthy follicle in the ovarian sections. The ovaries with yolk-filled ova were not sectioned.
Age determination

It has not become possible so far to determine the age of a House Swift past its nestling stage. Naik and Naik (1965a, b) separated the swifts into the "immatures" and "adults" on the basis of the size of bursa of Fabricius and the degree of pneumatization of the skull. These features, however, give no clue to a swift's age because no correlation has so far been derived between the age of the House Swift and the size of its bursa, or for that matter to the pneumatization of its skull. We still do not know whether the juvenile and first-year swifts live in the breeding colony, and at what age the swifts breed for the first time. The swifts used in the present study were past the nestling stage but otherwise of unknown age.